

# **Inclusive searches for squarks and gluinos with the ATLAS detector**

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# Introduction

- An overview of ATLAS analyses targeting **strong production** of SUSY particles using LHC 2012 8 TeV data.
- All presented analyses look at **R-parity preserving** models
  - **MET signature**
- Gluino and squark production, decay into quarks
  - **jet signature**
- Analyses presented target the following final states:
  - **Z production** [6 fb<sup>-1</sup>]
  - **1 or more taus** [21 fb<sup>-1</sup>]
  - **2 same sign leptons** [21 fb<sup>-1</sup>]
  - **0 lepton (2-6 jets)** [20 fb<sup>-1</sup>]
  - **0 lepton (7-10 jets)** [20 fb<sup>-1</sup>]

# Z, jets and MET

Targeting gluino production with decay into higgsino-like neutralino. Final decay to LSP through Z channel.

$$\tilde{g} \rightarrow q \tilde{q} \chi_1^0 \rightarrow q q' Z \tilde{G}$$

Trigger: Dilepton

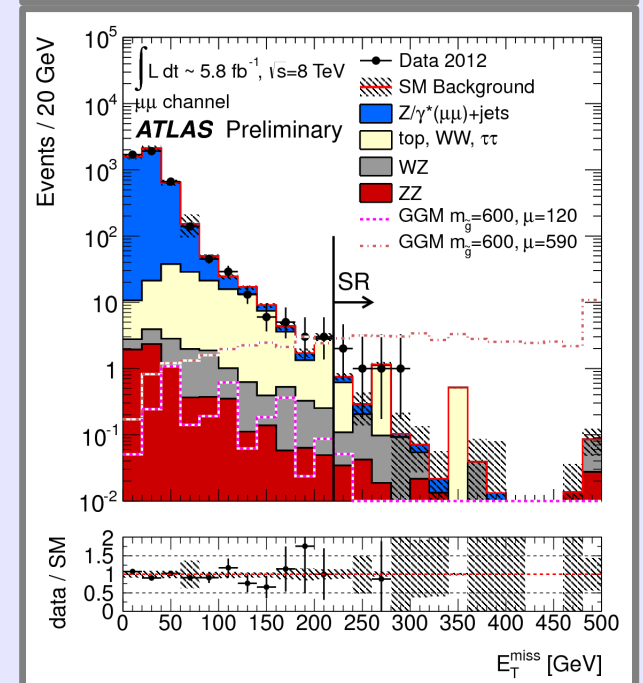
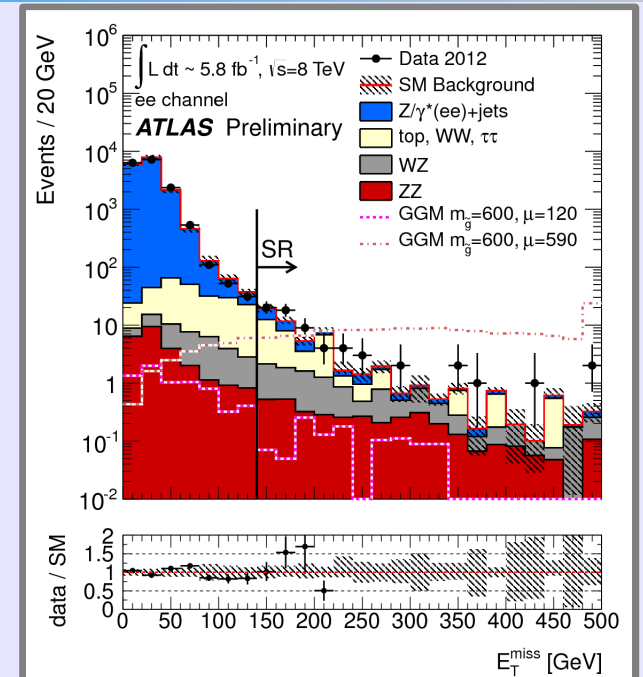
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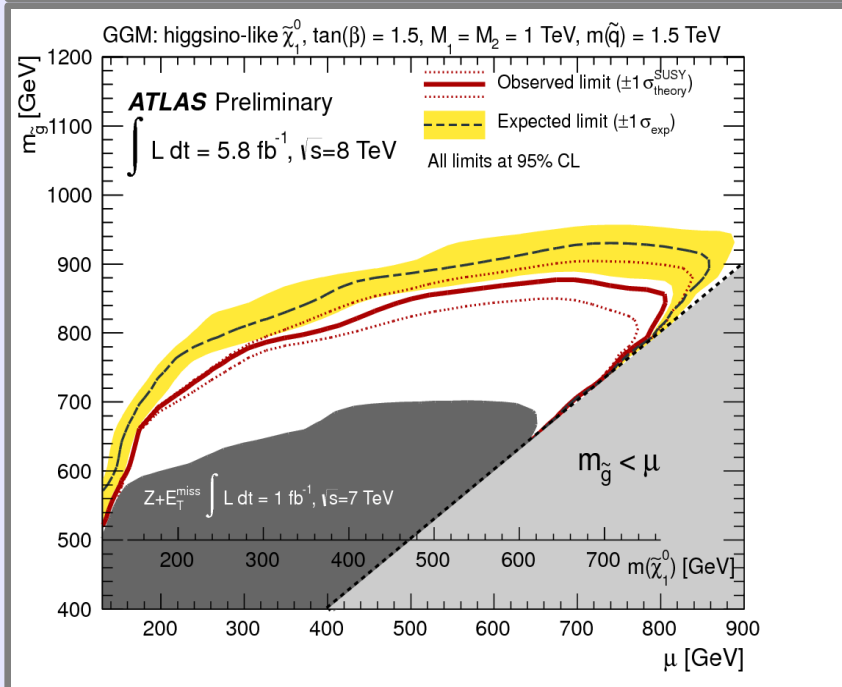
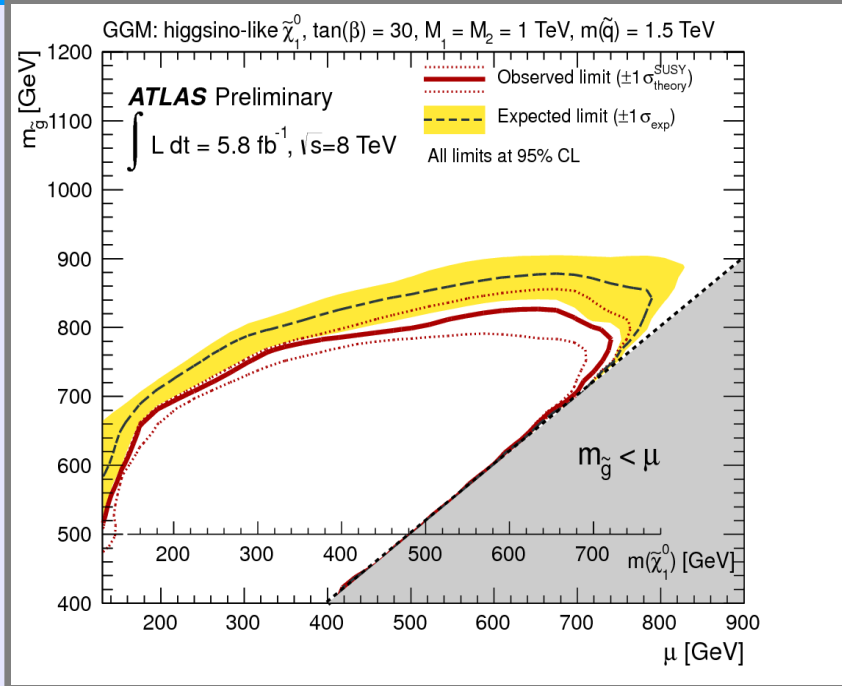
- Two leptons with invariant mass within Z mass window.
- Jet heavy SR: cuts on MET and jet P<sub>T</sub>'s
- More inclusive SR: lighter MET cut and H<sub>T</sub>.

## Backgrounds

- Z + jets: MET from instrumental effects, fully data driven
- WW, tt, Wt, Z/gamma → ττ: Data driven correction factor to MC.

	SR1	SR2
<b>MET</b>	> 200 GeV	> 140 GeV
<b>Jet P<sub>T</sub></b>	80/40/40 GeV	-
<b>H<sub>T</sub></b>	-	> 300 GeV





**Data and background expectation in agreement, no excess.**

Exclusion limits set for two GGM planes

Parameters:  $M_1 = M_2 = 1$ ,  $m(q) = 1.5$  TeV,  
 $\tan(\beta) = 1.5$  or  $40$

Exclusion of gluino masses between 680-820 GeV are excluded, for  $\chi_1^0$  masses between 160-720 GeV.

	Expected	Observed
<b>SR1 ee</b>	$3.1 \pm 1.1 \pm 0.5$	5
<b>SR1 <math>\mu\mu</math></b>	$3.2 \pm 1.3 \pm 0.4$	5
<b>SR2 ee</b>	$55.9 \pm 3.9 \pm 8.4$	66
<b>SR2 <math>\mu\mu</math></b>	$59.5 \pm 4.4 \pm 10.4$	61

# 1 or $\geq 2$ taus, jet and MET

Events with taus produced in neutralino or chargino decays through the stau decay channel.

**Trigger:** Jet + MET

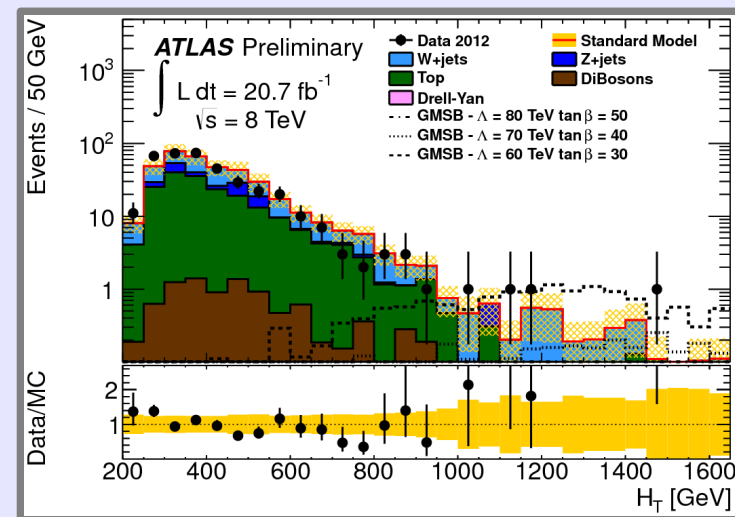
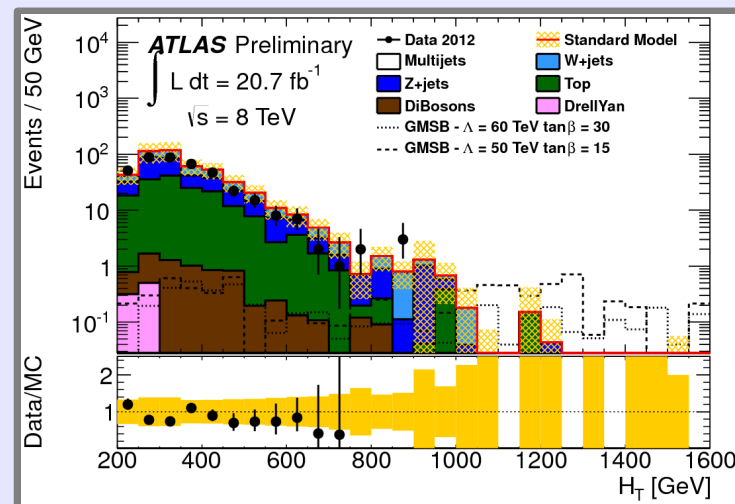
## Selection

- $P_T^{\text{jet1}} > 130 \text{ GeV}$ ,  $P_T^{\text{jet2}} > 30 \text{ GeV}$
- MET > 150 GeV
- = 1 medium tau  $P_T > 30 \text{ GeV}$  **or**  
 $\geq 2$  loose taus  $P_T > 20 \text{ GeV}$
- $\Delta\phi(\text{jets}, \text{MET})$  and MET/ $m_{\text{eff}}$  cuts
- Final cuts on  $M_T(M_T^1 + M_T^2)$  and  $H_T$

## Main backgrounds

- W+jets, top, Z+jets
  - data-driven correction on MC prediction
- Multijet contributions estimated from data.

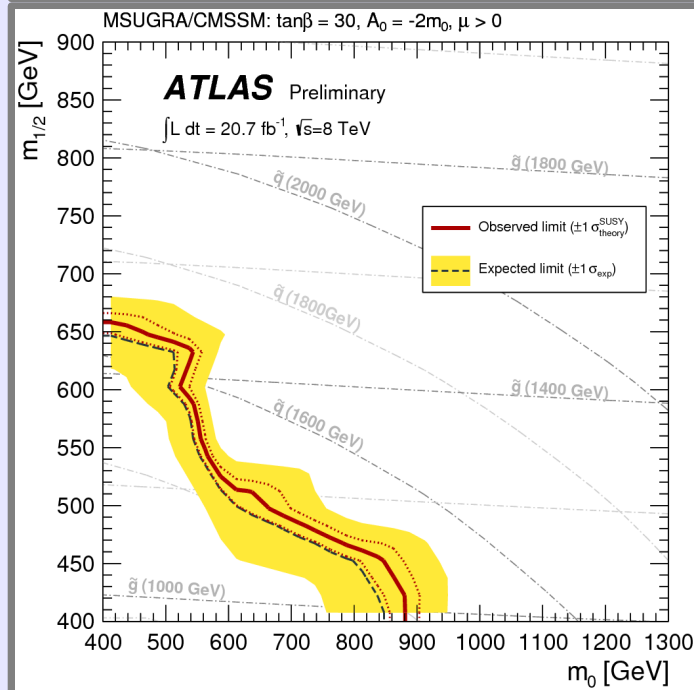
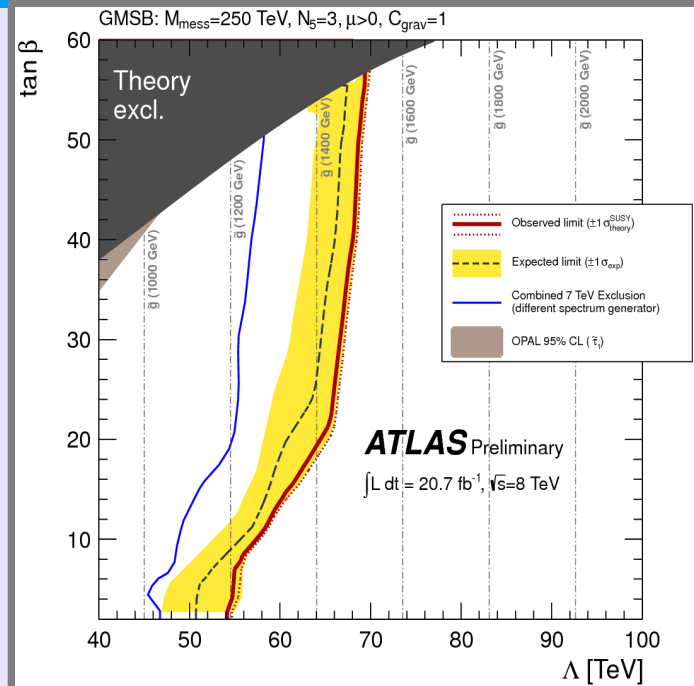
SR $\rightarrow$	1 tau	2 tau GMSB	2 tau nGM
$M_T(M_T^1 + M_T^2)$	140 GeV	150 GeV	250 GeV
$H_T$	800 GeV	900 GeV	600 GeV



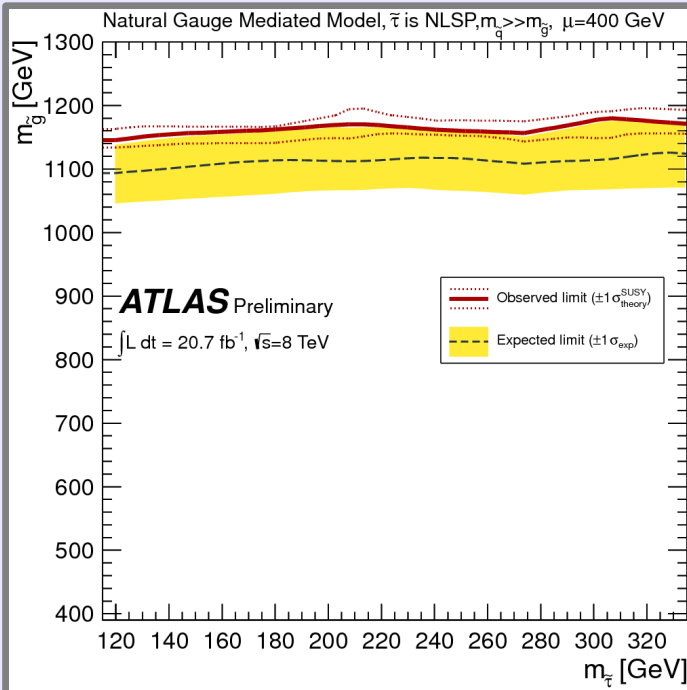
**Good agreement between data and background expectation, no excesses observed.**

Exclusion contours produced in the context of the GMSB, mSUGRA/cMSSM (“Higgs-aware”) and nGM models.

- GMSB ( $M_{\text{mess}}=250 \text{ TeV}, N_5=3, \mu>0, C_{\text{grav}}=1$ ): limit on SUSY breaking scale of 54 TeV for all  $\tan(\beta)$ , 70 TeV for  $\tan(\beta) > 50$
- mSUGRA/cMSSM( $\tan(\beta)=30, A_0 = -2m_0, \mu>0$ , compatible with a 126 GeV Higgs):  $m_0 < 860 \text{ GeV}$  for low  $m_{1/2}$  and  $m_{1/2} < 650 \text{ GeV}$  for low  $m_0$
- nGM ( $m_q \ll m_g, \mu=400 \text{ GeV}$ ): exclusion of gluino masses below 1140 GeV



	Expected	Observed
<b>1 tau</b>	$4.0 \pm 1.5$ $\pm 1.3$	3
<b>2 tau</b>	$7.2 \pm 1.3$ $\pm 1.6$	5
<b>2 tau</b>	$3.5 \pm 1.1$ $\pm 1.9$	1
<b>GMSB</b>		
<b>nGM</b>		



# 2 SS leptons, jet and MET

Searching for events with two isolated same sign leptons ( $ee, e\mu, \mu\mu$ ).

- Due to majorana nature of gluinos there is significant production of SS lepton pairs  $\rightarrow$  SM background suppression.

A versatile analysis sensitive to *long gluino and squark decay chains involving leptons.*

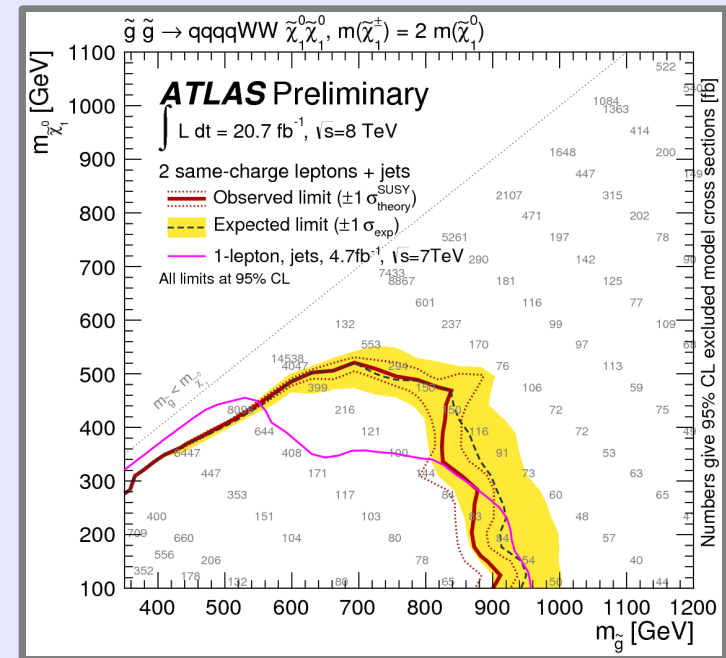
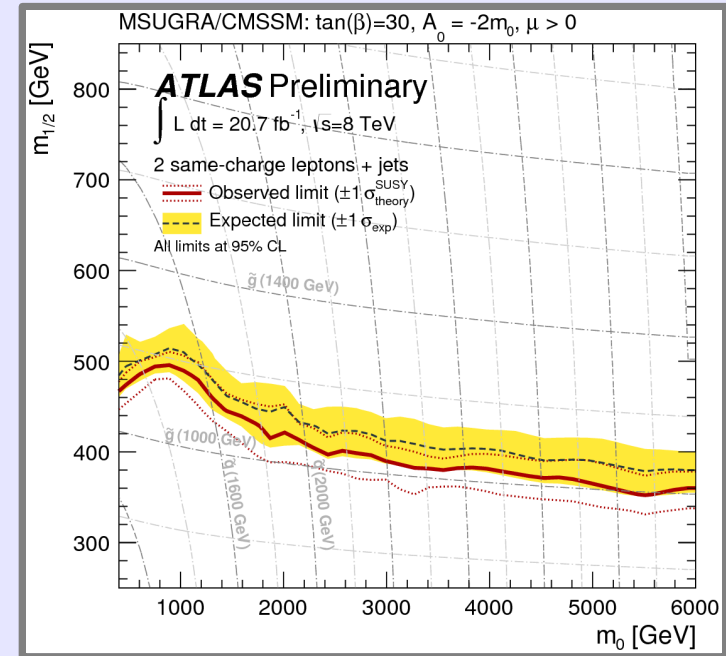
The analysis is presented in Mirjam Fehling's talk in this session.

## MSUGRA/CMSSM (“Higgs-aware”) model

Gluinos with masses below 1000 GeV excluded.

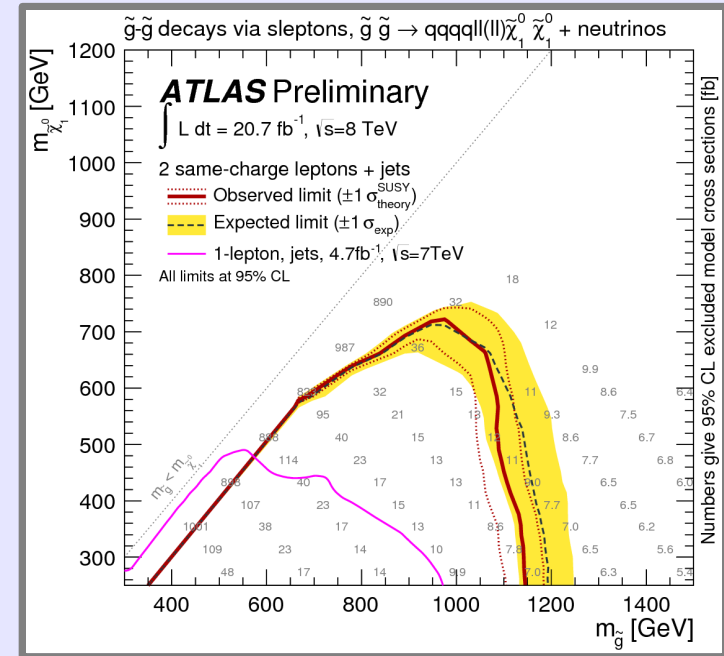
## Gluino-squark model

Gluino masses up to 750-800 GeV excluded for  $\chi_1^0$  masses below 450 GeV.



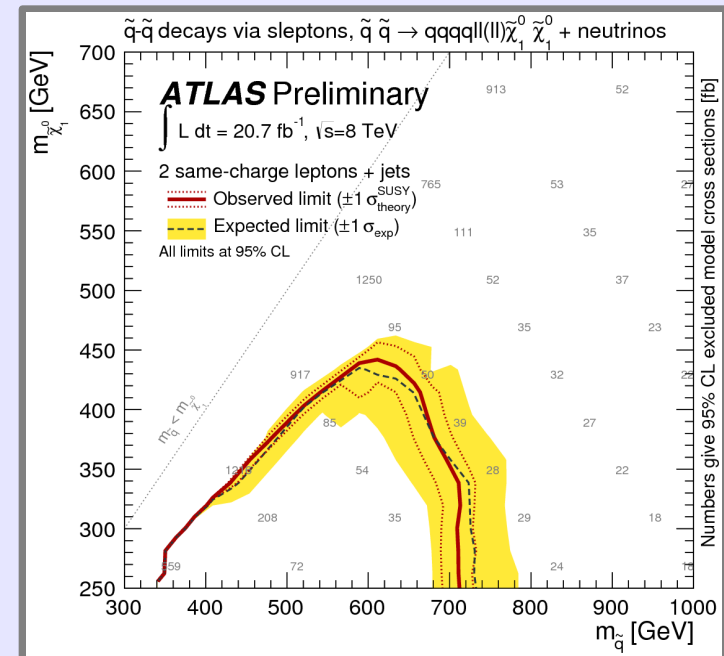
## Gluino-squark model

Gluino masses up to 1000-1100 GeV excluded for  $\chi_1^0$  below 650 GeV.



## Direct squark model

Squark masses up to 600-660 GeV excluded for  $\chi_1^0$  below 380 GeV.



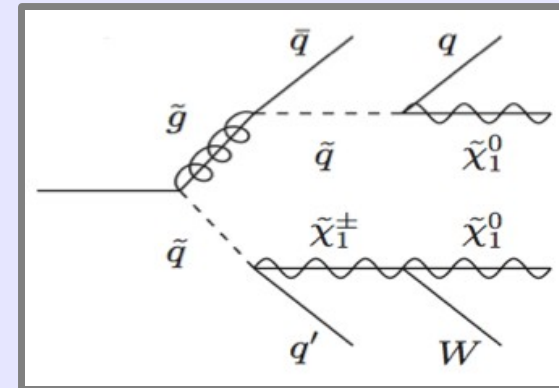


Targeting gluino and squark production, decaying to  $\chi_1^0$  with jet production.

**Trigger:** Jet + MET

## Selection

- MET > 160 GeV
- $P_T(\text{jet 1}) > 130$  GeV,  $P_T(\text{jet 2-6}) > 60$  GeV
- Inclusive channels:  $\geq 2, \geq 3, \dots, \geq 6$  jets
- e/ $\mu$  veto, minimum  $\Delta\phi$  (jets, MET) cut
- final Signal Region (SR) cuts on:
  - MET/ $m_{\text{eff}}$  (N leading jets in each SR) and  $m_{\text{eff}}$  (all jets w/  $P_T > 40$  GeV)
  - Up to three cut levels per SR.



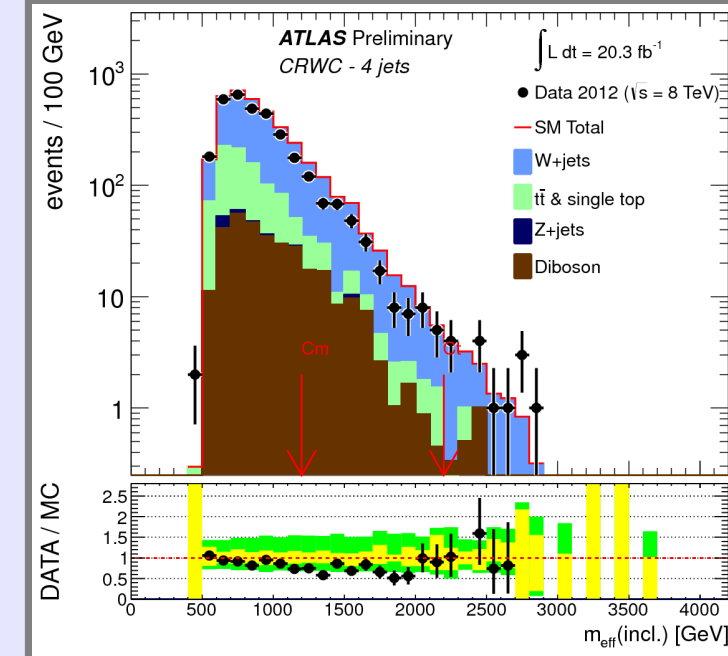
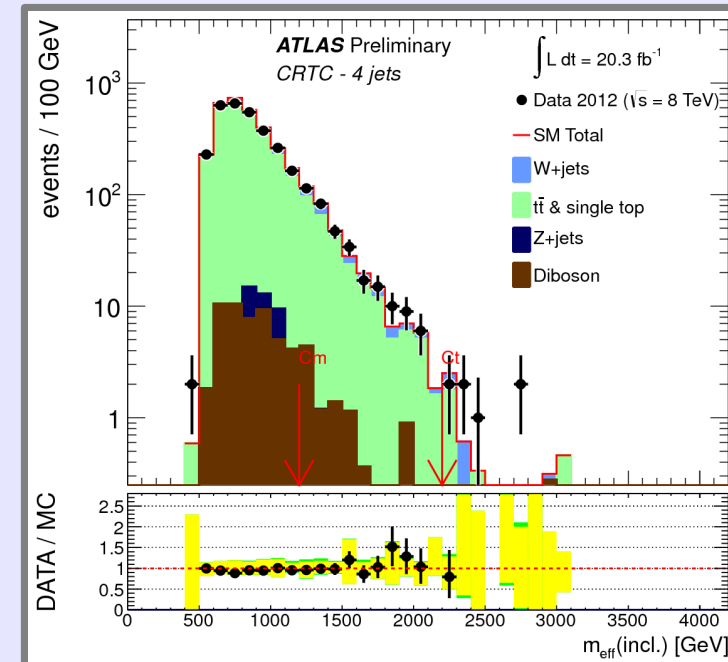
# Backgrounds

Data-driven estimation of all primary backgrounds.

- CR for each background and each SR
  - Defined as the SR with additional cuts
- Transfer factor between CR and SR obtained from MC (estimated from data for multijets)
- Estimate SR contribution from CR contents in data and transfer factor.

Final determination of backgrounds from a fit over SR and corresponding CR's.

Process	CR definition	
Multijets	Reversed QCD rejection cuts	
Z + jets	Gamma + jets	
W + jets	$30 < m_T(l, MET)$	b-tag veto
Top	$< 100 \text{ GeV}$	b-tag required

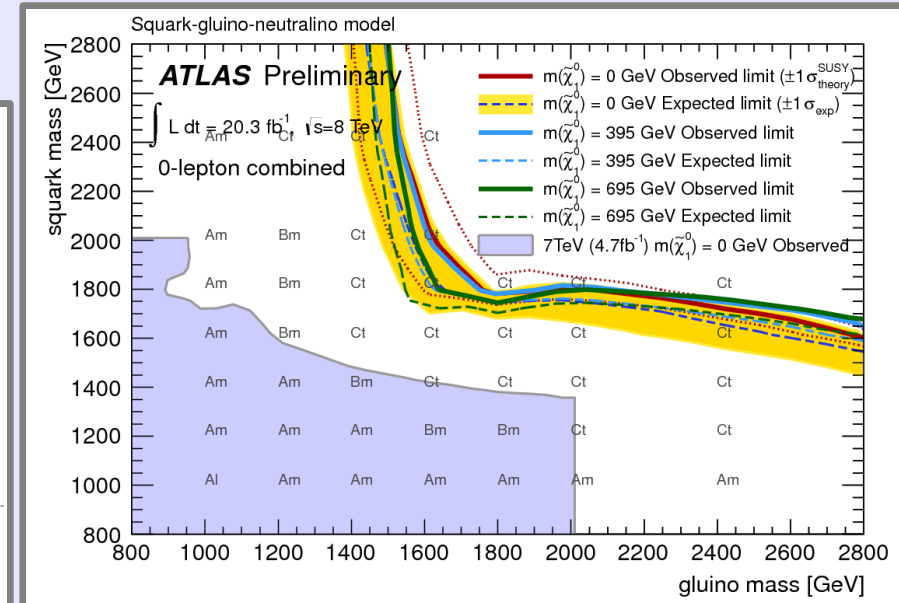
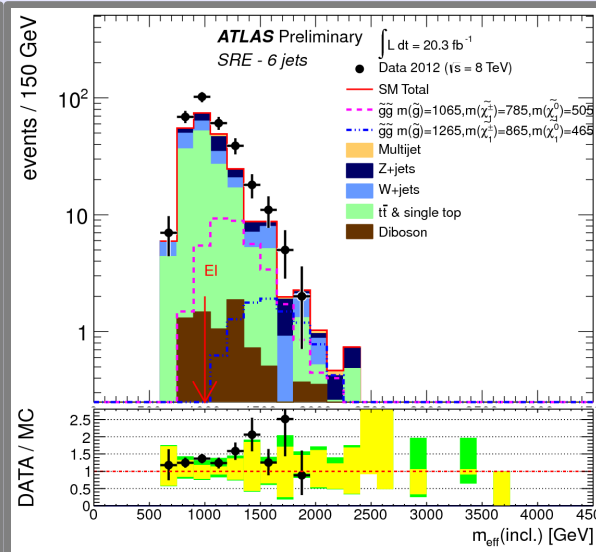
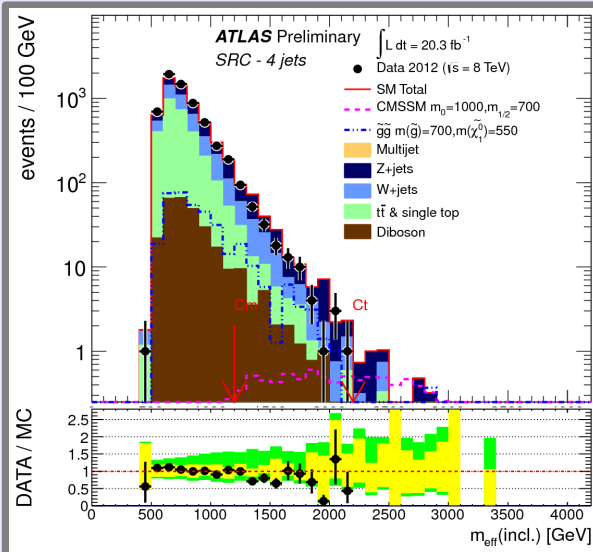
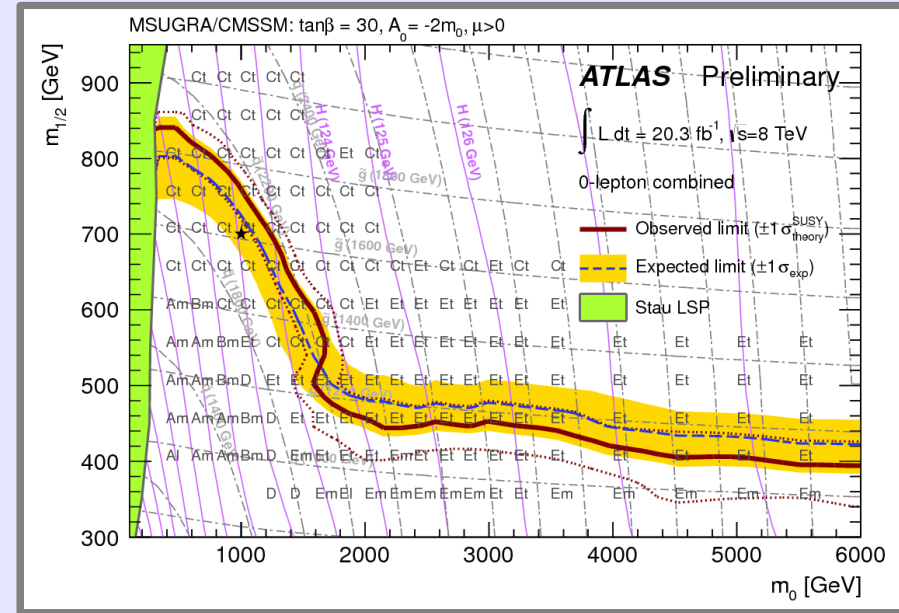


# Results

Good agreement between data and expected background.

Exclusion contours for mSUGRA/cMSSM (“Higgs-aware”) and simplified models.

- Values of  $m_{1/2}$  below 300 GeV excluded.
- Values of  $m_{1/2}$  below 800 GeV excluded for low  $m_0$



Target similar as in the previous analysis, **but larger jet multiplicity** SR's, targeting *longer decay chains* possibly including *3<sup>rd</sup> generation squarks*.

**Trigger:** Multijets

**Two selection streams:**

- Multi-jets + flavour SR's:
  - Jet  $P_T$  (multiplicity):  $P_T > 50$  GeV (=8, =9,  $\geq 10$ ) **or**  
 $P_T > 80$  GeV (=7,  $\geq 8$ )
  - SR's further split by b-tag multiplicity (=0, =1,  $\geq 2$ )
- Multi-jets +  $\Sigma m_j$  SR's:
  - Jet  $P_T$  (multiplicity):  $P_T > 80$  GeV ( $\geq 8$ ,  $\geq 9$ ,  $\geq 10$ )
  - Selected jets used as seed for constructing composite fat jets ( $\Delta R = 1.0$ )
  - Cut on sum of resulting jet invariant masses, for jets w/  $P_T > 100$  GeV (340 and 420 GeV cuts)

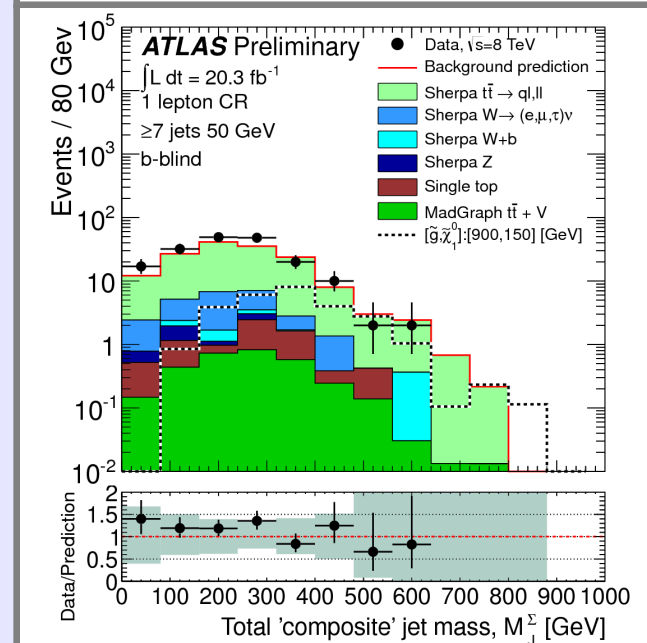
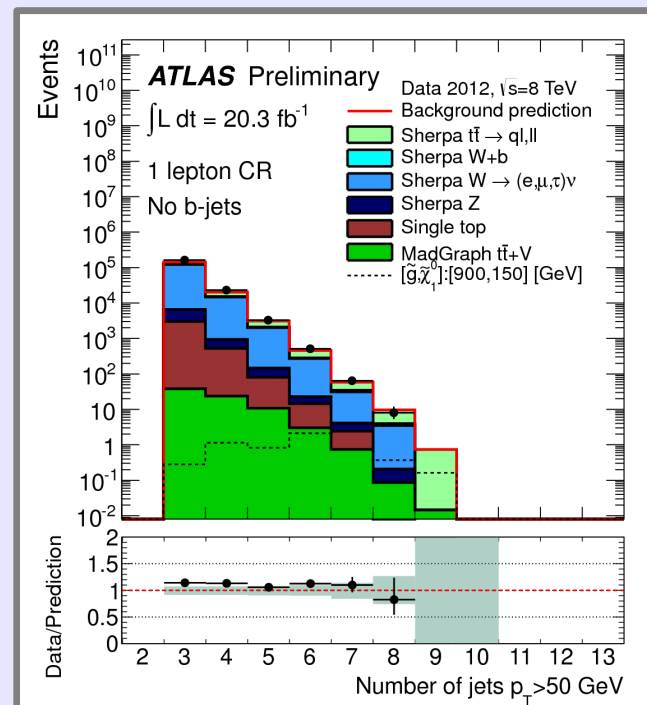
Final cut on  $\text{MET}/\sqrt{H_T} > 4 \text{ GeV}^{1/2}$

## Multijets and top (hadronic decays) production

- Data-driven estimation: Use the fact that the MET/sqrt(HT) distribution invariant w.r.t. jet multiplicity.
- CR uses an orthogonal MET/sqrt( $H_T$ ) < 1.5 GeV<sup>1/2</sup> cut.
- From data obtain transfer factor between CR and SR.
  - Use region with lower multiplicity of jets than SR's.
- Use this to extrapolate from CR to SR.

## W+jets, tt, Z+jets (semi-leptonic decays)

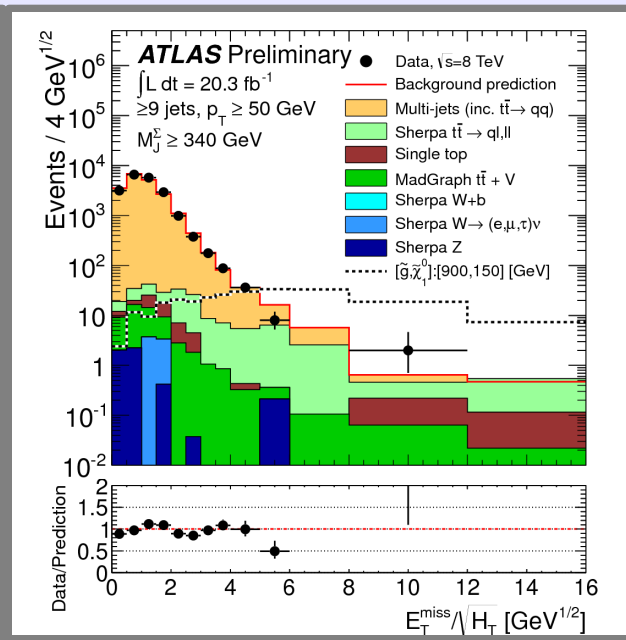
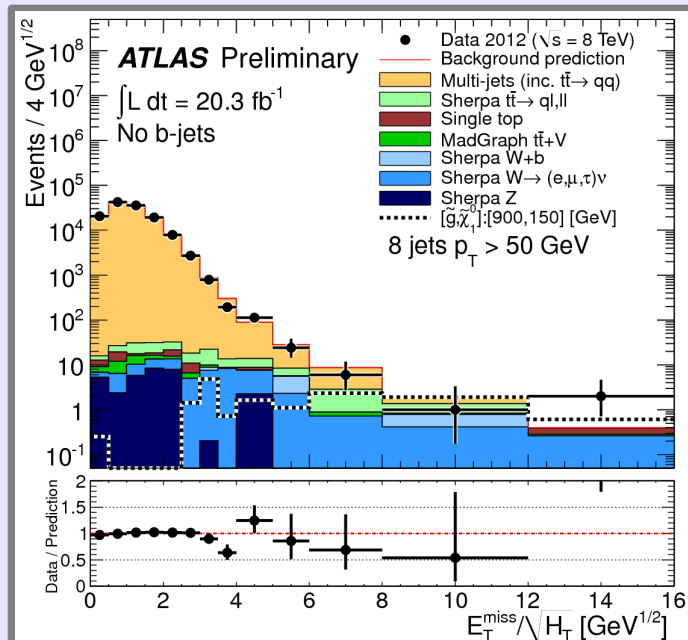
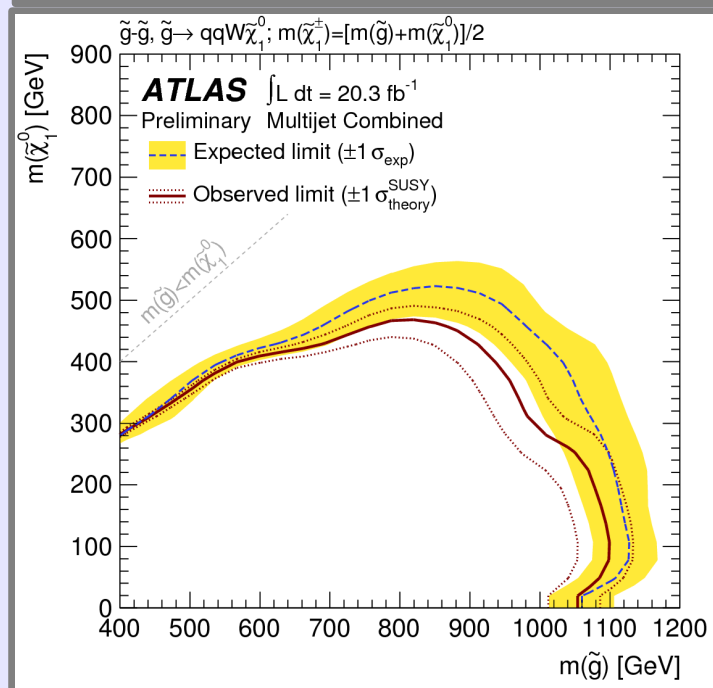
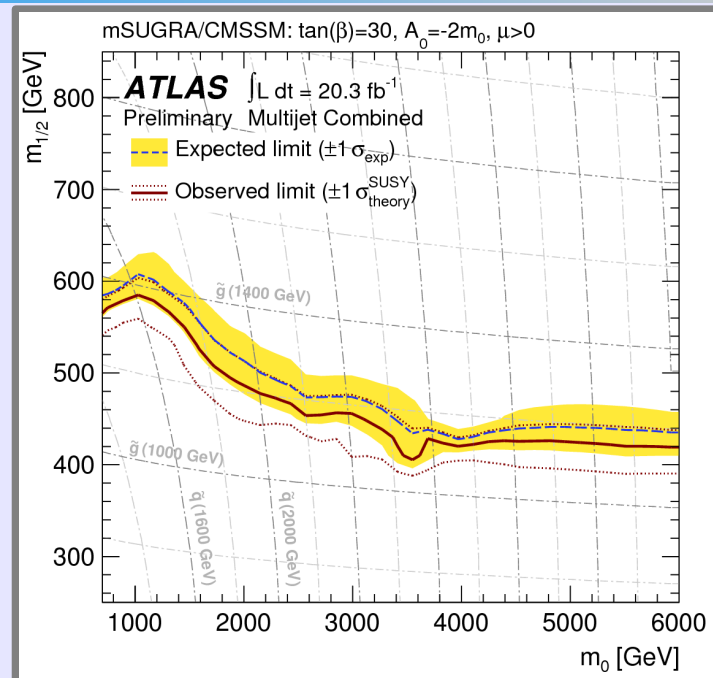
- Primarily from hadronic tau decays or unidentified leptons.
- MC distributions normalised to data in control regions.
- Control regions same as the SR but require a lepton
  - leptons treated as jets, simulating a hadronic tau decay.
  - Additional selection on  $m_T$ , MET and MET/sqrt(HT).
- Normalisation of MC determined by fit to data in the CR's.



Good agreement between data and expected background, no excess observed.

Exclusion contours for mSUGRA/CMSSM (“Higgs-aware”) and simplified models.

- Gluino masses lower than 1100 GeV are excluded
- Simplified models also considered.
- Gluino-squark model: for neutralino masses below 350 GeV gluino masses below 1100 GeV are excluded.



# Conclusions and summary

Presenting the latest results on inclusive gluino and squark searches with ATLAS.

- No evidence of SUSY seen in the 2012 dataset, analyses have placed limits on SUSY cross-section and constrained model parameters.
- Most analyses have moved to the complete 2012 8 TeV dataset.
- Data analysis still continuing, more to come!

All ATLAS supersymmetry results can be found here:

<https://twiki.cern.ch/twiki/bin/view/AtlasPublic/SupersymmetryPublicResults>

# List of notes presented

## I **ATLAS-CONF-2012-152**

“Search for supersymmetry in final states with jets, missing transverse momentum and a Z boson at  $\sqrt{s} = 8$  TeV with the ATLAS detector.”

## II **ATLAS-CONF-2013-026**

“Search for Supersymmetry in Events with Large Missing Transverse Momentum, Jets, and at Least One Tau Lepton in 21 fb<sup>-1</sup> of  $\sqrt{s} = 8$  TeV Proton-Proton Collision Data with the ATLAS Detector.”

## III **ATLAS-CONF-2013-007**

“Search for strongly produced superpartners in final states with two same sign leptons with the ATLAS detector using 21 fb<sup>-1</sup> of proton-proton collisions at  $\sqrt{s}=8$  TeV.”

## IV **ATLAS-CONF-2013-047**

“Search for squarks and gluinos with the ATLAS detector using final states with jets and missing transverse momentum and 20.3 fb<sup>-1</sup> of  $\sqrt{s}=8$  TeV proton-proton collision data”

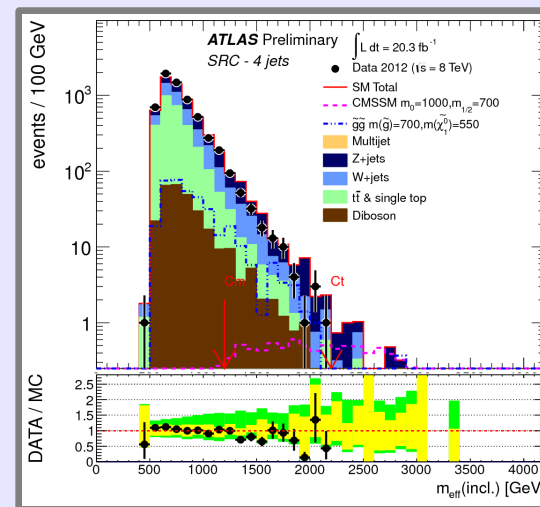
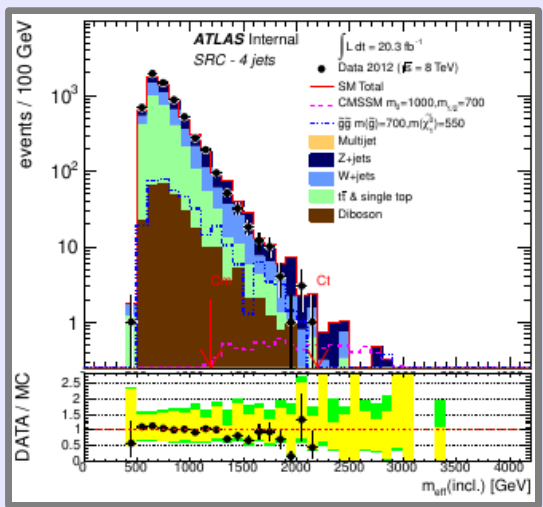
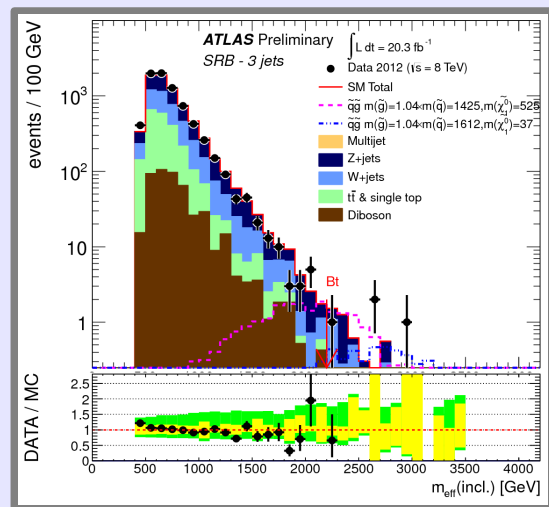
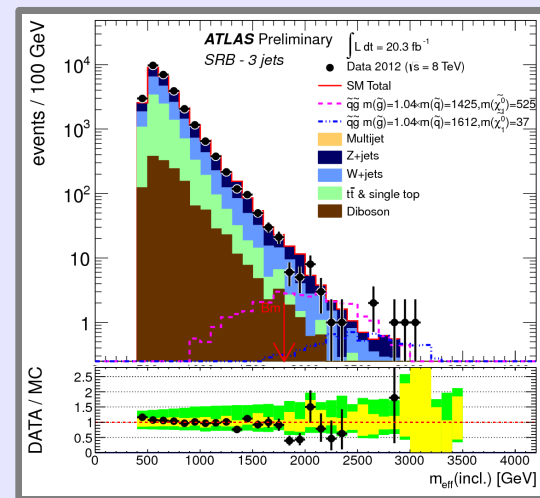
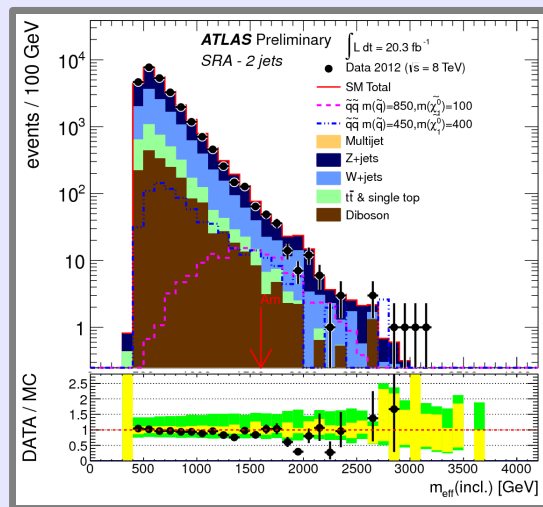
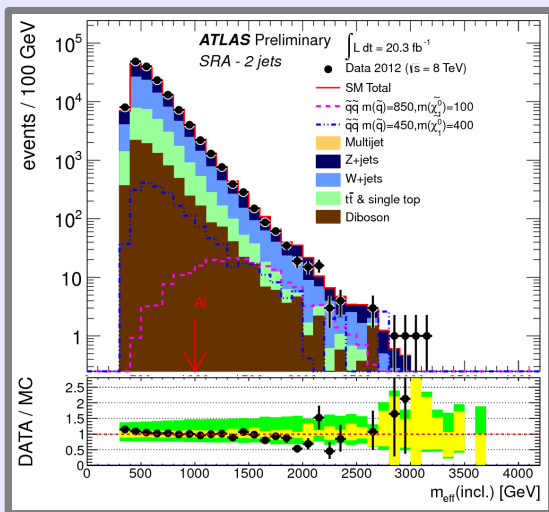
## V **ATLAS-CONF-2013-054**

“Quest for new phenomena using large jet multiplicities and missing transverse momentum with ATLAS in 20.3/fb of 8 TeV proton-proton collisions”

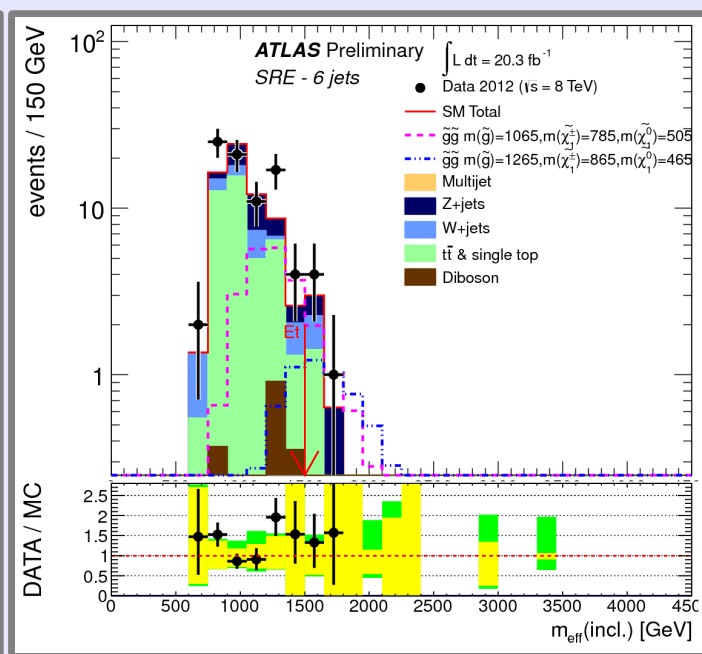
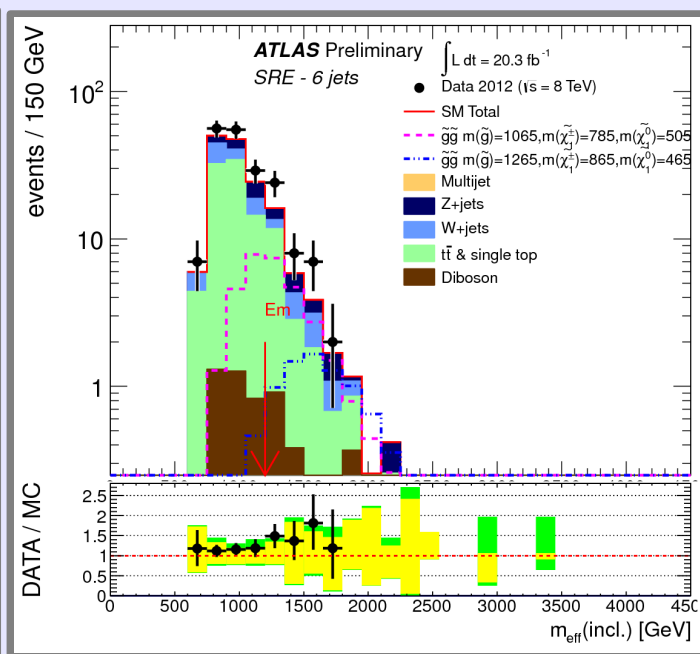
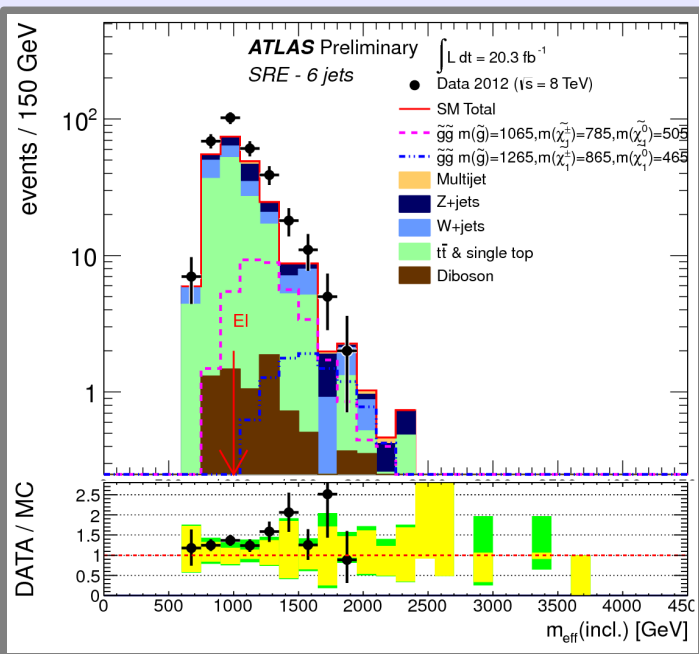


# Backup material

# 0-lepton (2-6 jets) – SR details



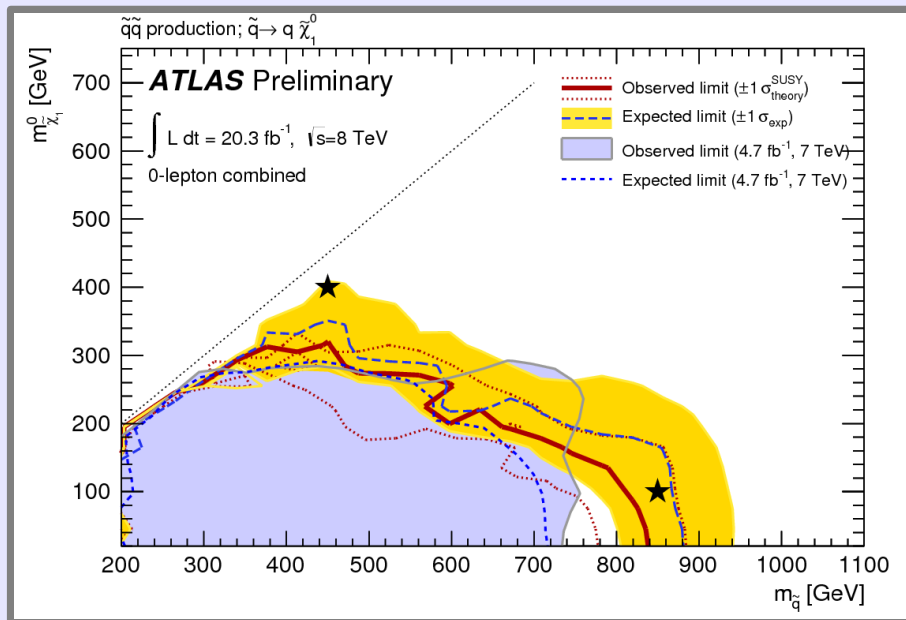
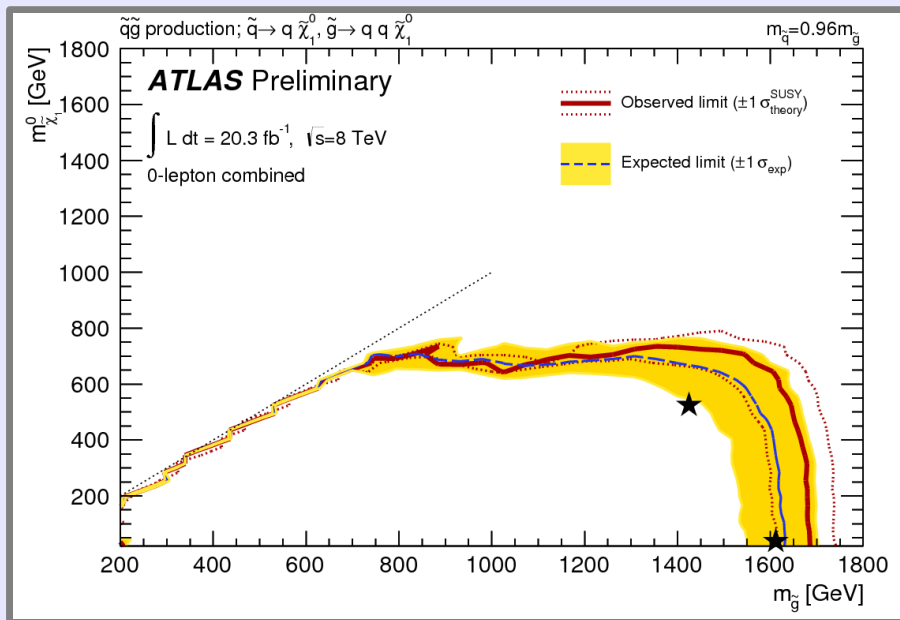
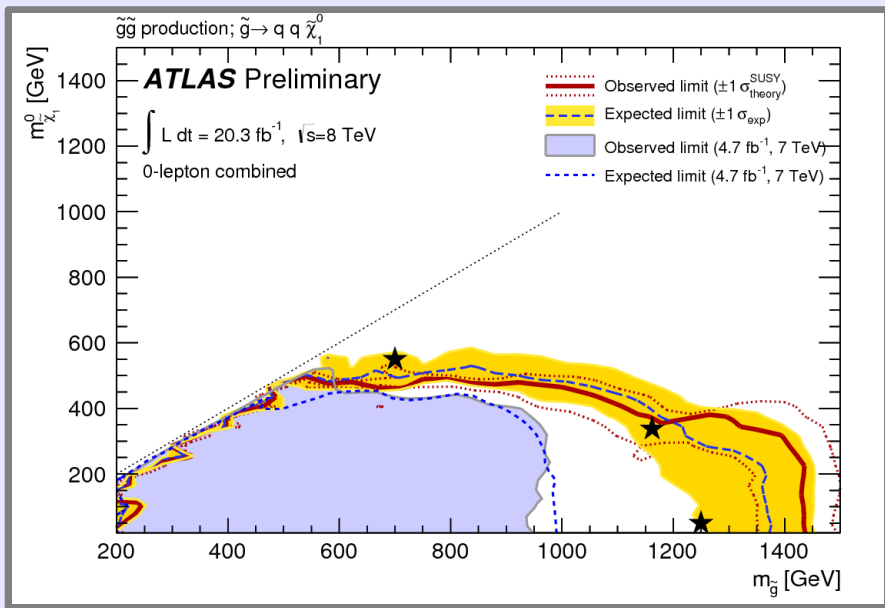
# 0-lepton (2-6 jets) - SR details



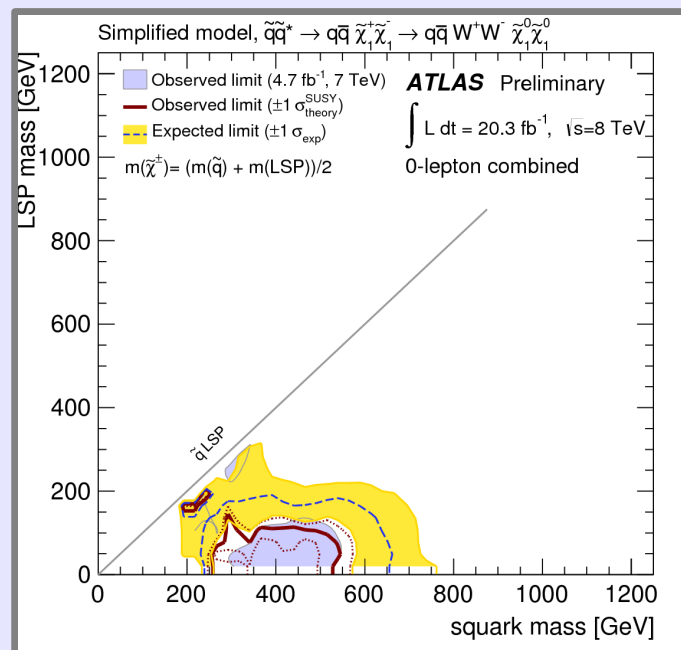
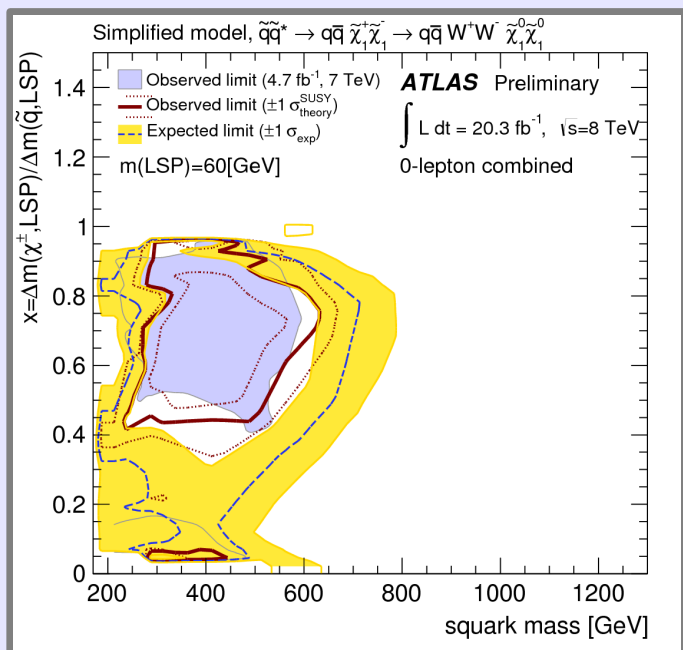
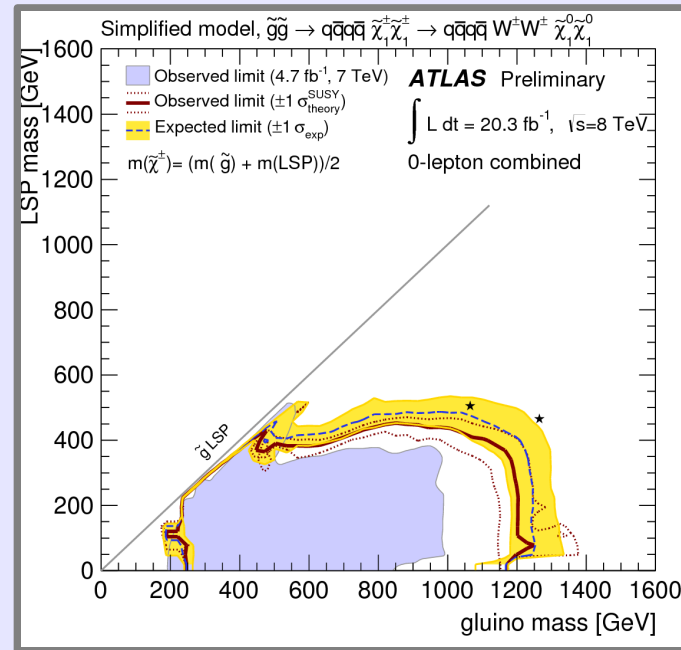
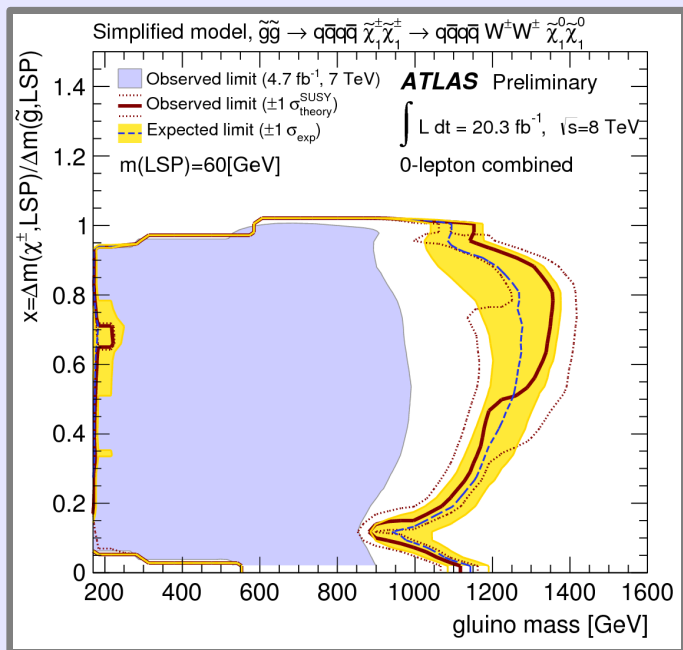
# 0-lepton (2-6 jets) – SR counts

Signal Region	A-loose	A-medium	B-medium	B-tight	C-medium	C-tight
MC expected events						
Diboson	428.6	15.0	4.3	0.0	25.5	0.0
Z/ $\gamma^*$ +jets	2044.4	83.1	20.6	2.3	119.4	2.6
W+jets	2109.0	58.8	16.4	2.1	88.7	1.0
$t\bar{t}$ (+EW) + single top	785.9	8.2	2.0	0.3	45.9	0.3
Fitted background events						
Diboson	430 $\pm$ 190	15 $\pm$ 7	4.3 $\pm$ 2.0	–	26 $\pm$ 11	–
Z/ $\gamma^*$ +jets	1870 $\pm$ 320	57 $\pm$ 11	16 $\pm$ 5	0.2 $\pm$ 0.5	80 $\pm$ 29	0.0 <sup>+0.6</sup> <sub>-0.0</sub>
W+jets	1540 $\pm$ 260	42 $\pm$ 11	10 $\pm$ 4	1.6 $\pm$ 1.2	55 $\pm$ 18	0.7 $\pm$ 0.9
$t\bar{t}$ (+EW) + single top	870 $\pm$ 180	7.8 $\pm$ 2.8	2.2 $\pm$ 2.0	0.6 $\pm$ 0.7	50 $\pm$ 11	0.9 $\pm$ 0.9
Multi-jets	33 $\pm$ 33	–	0.1 $\pm$ 0.1	–	–	–
Total bkg	4700 $\pm$ 500	122 $\pm$ 18	33 $\pm$ 7	2.4 $\pm$ 1.4	210 $\pm$ 40	1.6 $\pm$ 1.4
Observed	5333	135	29	4	228	0
$\langle \epsilon\sigma \rangle_{\text{obs}}^{95}$ [fb]	66.07	2.52	0.73	0.33	4.00	0.12
$S_{\text{obs}}^{95}$	1341.2	51.3	14.9	6.7	81.2	2.4
$S_{\text{exp}}^{95}$	1135.0 <sup>+332.7</sup> <sub>-291.5</sub>	42.7 <sup>+15.5</sup> <sub>-11.4</sub>	17.0 <sup>+6.6</sup> <sub>-4.6</sub>	5.8 <sup>+2.9</sup> <sub>-1.8</sub>	72.9 <sup>+23.6</sup> <sub>-18.0</sub>	3.3 <sup>+2.1</sup> <sub>-1.2</sub>
$p_0(Z_n)$	0.45 (0.1)	0.27 (0.6)	0.50 (0.0)	0.34 (0.4)	0.34 (0.4)	0.50 (0.0)

Signal Region	D	E-loose	E-medium	E-tight
MC expected events				
Diboson	2.0	5.5	1.7	0.0
Z/ $\gamma^*$ +jets	8.5	19.6	6.3	1.9
W+jets	4.8	23.1	5.2	0.8
$t\bar{t}$ (+EW) + single top	5.0	67.3	16.8	1.5
Fitted background events				
Diboson	$2.0 \pm 2.0$	$5.5 \pm 2.1$	$1.7 \pm 0.8$	–
Z/ $\gamma^*$ +jets	$3.8 \pm 2.5$	$12 \pm 7$	$2.9 \pm 2.6$	$0.4 \pm 0.6$
W+jets	$3.3 \pm 2.5$	$18 \pm 7$	$4.9 \pm 2.7$	$0.7 \pm 0.5$
$t\bar{t}$ (+EW) + single top	$5.8 \pm 2.1$	$76 \pm 19$	$20 \pm 6$	$1.7 \pm 1.4$
Multi-jets	–	$1.0 \pm 1.0$	–	–
Total bkg	$15 \pm 5$	$113 \pm 21$	$30 \pm 8$	$2.9 \pm 1.8$
Observed	18	166	41	5
$\langle \epsilon\sigma \rangle_{\text{obs}}^{95}$ [fb]	0.77	4.55	1.41	0.41
$S_{\text{obs}}^{95}$	15.5	92.4	28.6	8.3
$S_{\text{exp}}^{95}$	$13.6^{+5.1}_{-3.5}$	$57.3^{+20.0}_{-14.4}$	$21.4^{+7.6}_{-5.8}$	$6.5^{+3.0}_{-1.9}$
$p_0 (Z_n)$	0.32 (0.5)	0.03 (1.9)	0.14 (1.1)	0.22 (0.8)

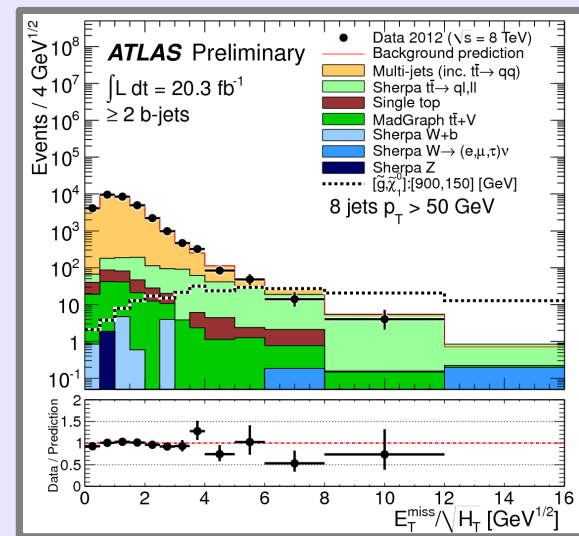
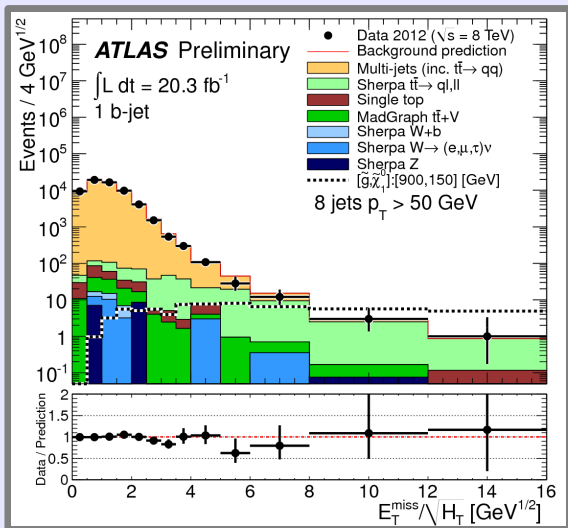
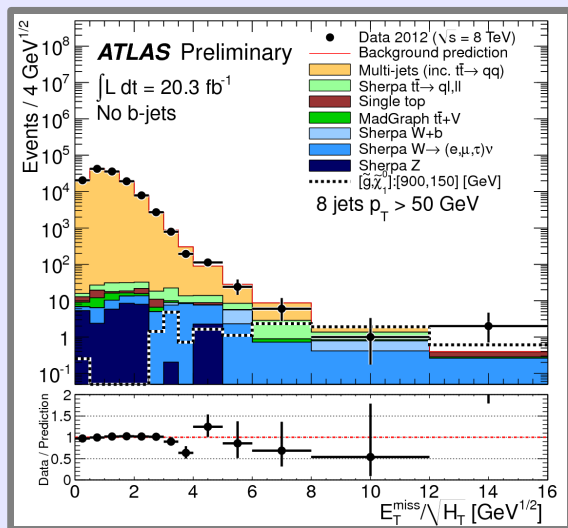
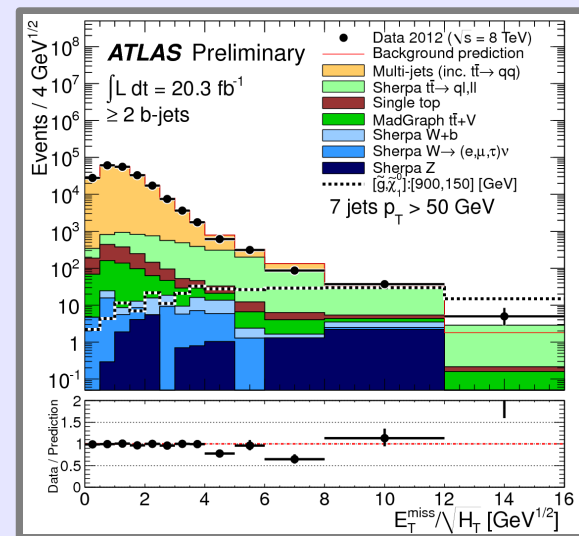
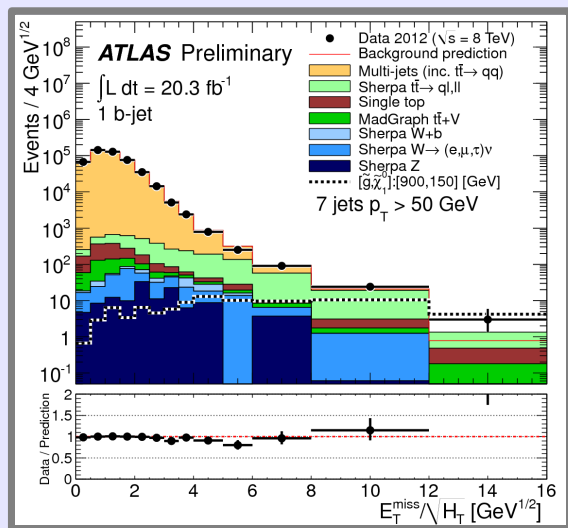
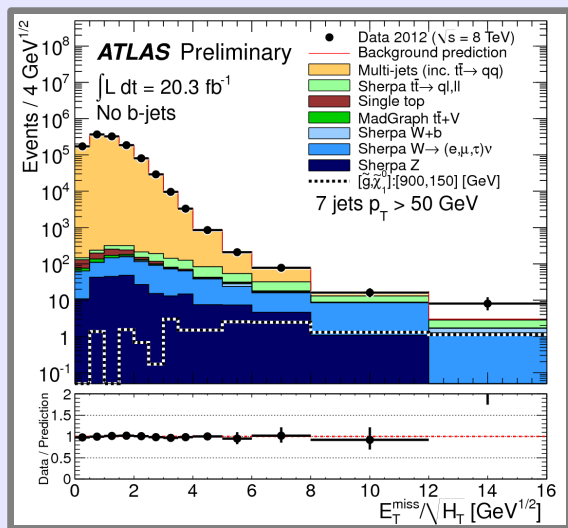


# 0-lepton (2-6 jets) - More grids



# 0-lepton (7-10 jets) – SR details

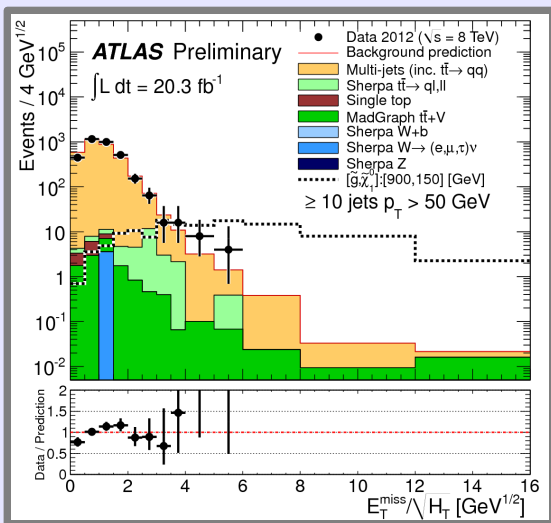
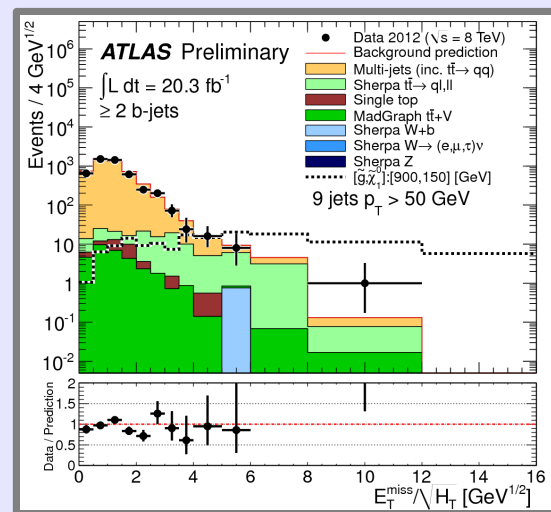
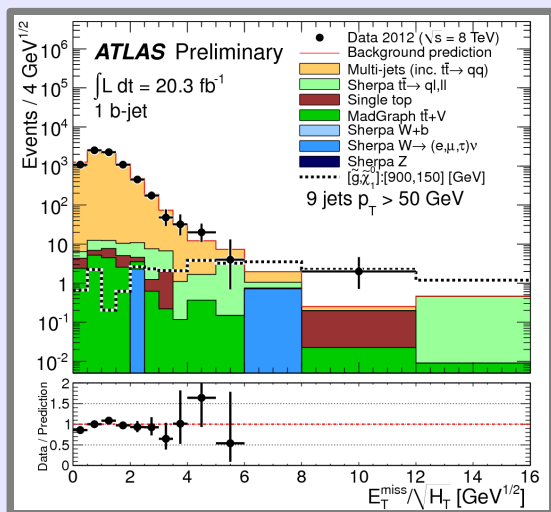
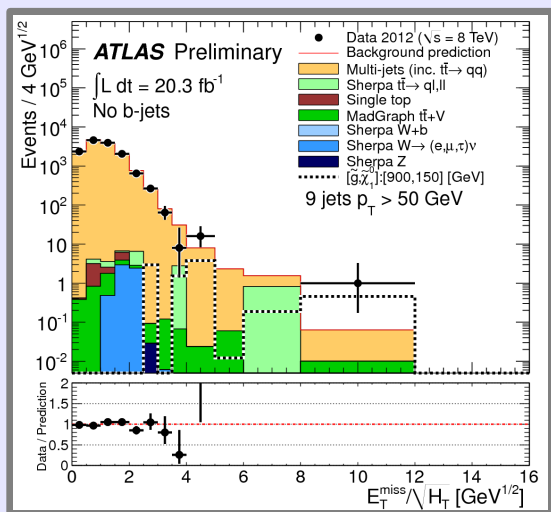
Multijet + flavour stream,  $P_T > 50$  GeV



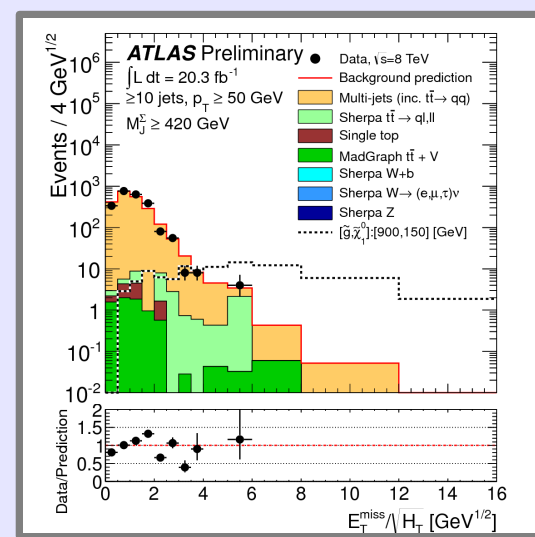
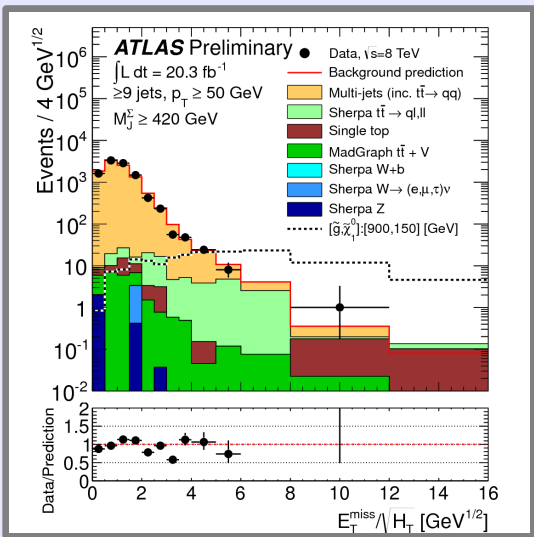
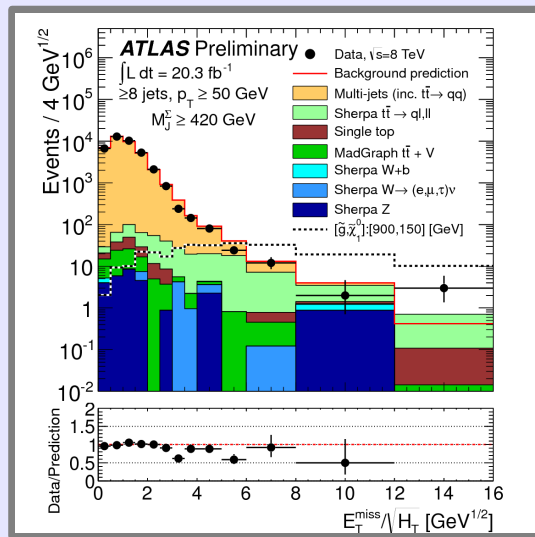
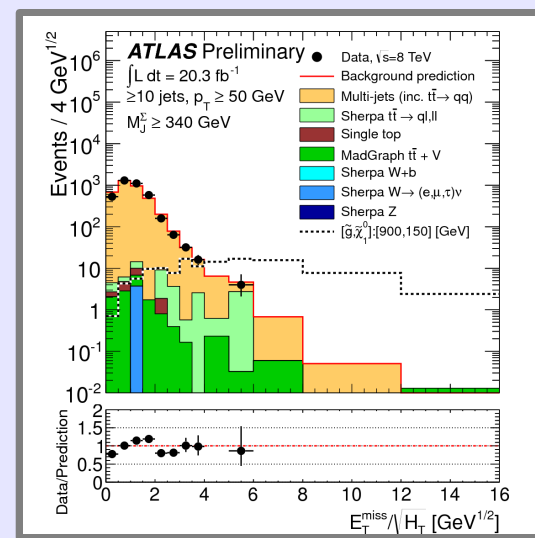
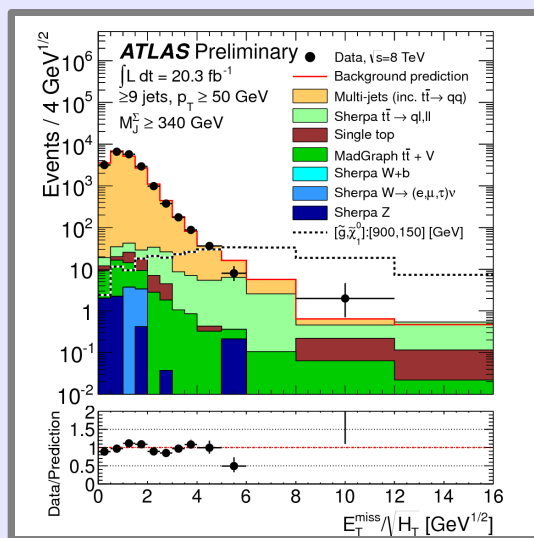
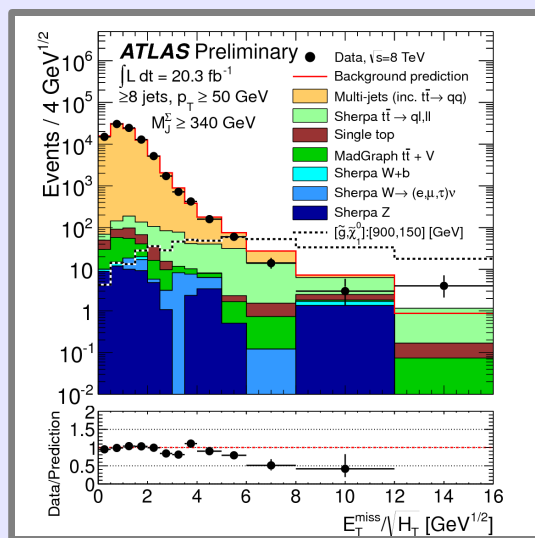


# 0-lepton (7-10 jets) – SR details

Multijet + flavour stream,  $P_T > 50$  GeV



# 0-lepton (7-10 jets) – SR details



# 0-lepton (7-10 jets) – SR counts

Signal region	8j50			9j50			10j50
<i>b</i> -jets	0	1	≥ 2	0	1	≥ 2	—
Observed events	40	44	44	5	8	7	3
Total events after fit	35 ± 4	40 ± 10	50 ± 10	3.3 ± 0.7	6.1 ± 1.7	8.0 ± 2.7	1.37 ± 0.35
Fitted $t\bar{t}$	2.7 ± 0.9	11.8 ± 3.0	23.0 ± 5.0	0.36 ± 0.18	1.5 ± 0.5	3.2 ± 1.1	0.06 <sup>+0.09</sup> <sub>-0.06</sub>
Fitted <i>W</i> +jets	2.0 <sup>+2.6</sup> <sub>-2.0</sub>	0.62 <sup>+0.81</sup> <sub>-0.62</sub>	0.20 <sup>+0.28</sup> <sub>-0.20</sub>	-	0.24 <sup>+0.65</sup> <sub>-0.24</sub>	-	-
Fitted others	2.9 <sup>+1.8</sup> <sub>-1.8</sub>	1.7 <sup>+1.5</sup> <sub>-1.2</sub>	2.8 <sup>+2.3</sup> <sub>-2.0</sub>	0.03 ± 0.03	0.38 ± 0.25	0.40 <sup>+0.60</sup> <sub>-0.24</sub>	0.08 ± 0.08
Total events before fit	36	48	59	3.4	6.6	8.9	1.39
$t\bar{t}$ before fit	3.5	15	30	0.41	1.8	4	0.08
<i>W</i> +jets before fit	2.9	1.0	0.29	-	0.40	-	-
Others before fit	2.4	1.8	2.8	0.03	0.34	0.4	0.08
Multi-jets	27 ± 3	30 ± 10	26 ± 10	3.0 ± 0.6	4.0 ± 1.4	4.4 ± 2.2	1.23 ± 0.32
$N_{\text{BSM}}^{95\%}(\text{exp})$	16	23	26	5	7	8	4
$N_{\text{BSM}}^{95\%}(\text{obs})$	20	23	22	7	9	7	6
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon(\text{exp})$ [fb]	0.8	1.2	1.3	0.26	0.36	0.40	0.19
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon(\text{obs})$ [fb]	0.97	1.1	1.1	0.34	0.43	0.37	0.29
$p_0$	0.24	0.5	0.7	0.21	0.28	0.6	0.13
Significance ( $\sigma$ )	0.7	-0.02	-0.6	0.8	0.6	-0.28	1.14

Signal region	7j80			8j80		
<i>b</i> -jets	0	1	≥ 2	0	1	≥ 2
Observed events	12	17	13	2	1	3
Total fitted events	11.0 ± 2.2	17 ± 6	25 ± 10	0.9 ± 0.6	1.5 ± 0.9	3.3 ± 2.2
Fitted $t\bar{t}$	0.00 <sup>+0.26</sup> <sub>-0.00</sub>	5.0 ± 4.0	12 ± 9	0.10 <sup>+0.14</sup> <sub>-0.10</sub>	0.32 <sup>+0.67</sup> <sub>-0.32</sub>	1.5 <sup>+1.9</sup> <sub>-1.5</sub>
Fitted <i>W</i> +jets	0.07 <sup>+0.38</sup> <sub>-0.07</sub>	0.29 <sup>+0.37</sup> <sub>-0.29</sub>	-	-	-	-
Fitted others	1.9 <sup>+1.1</sup> <sub>-0.9</sub>	0.71 <sup>+0.31</sup> <sub>-0.25</sub>	2.6 <sup>+1.7</sup> <sub>-1.1</sub>	0.02 ± 0.02	0.02 ± 0.02	0.32 <sup>+0.36</sup> <sub>-0.21</sub>
Total events before fit	11.7	16	23	0.8	1.8	3.3
$t\bar{t}$ before fit	0.34	4	10	0.08	0.6	1.5
<i>W</i> +jets before fit	0.46	0.29	-	-	-	-
Others before fit	1.8	0.89	3.0	0.02	0.02	0.35
Multi-jets	9.1 ± 1.6	11 ± 4	10 ± 4	0.75 ± 0.56	1.2 ± 0.5	1.4 ± 1.0
$N_{\text{BSM}}^{95}$ (exp)	10	17	14	4	4	6
$N_{\text{BSM}}^{95}$ (obs)	10	16	12	5	3.5	6
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon$ (exp) [fb]	0.5	0.8	0.7	0.18	0.18	0.31
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon$ (obs) [fb]	0.5	0.8	0.6	0.24	0.17	0.31
$p_0$	0.5	0.6	0.8	0.19	0.6	0.5
Significance ( $\sigma$ )	0.05	-0.14	-1.0	0.9	-0.28	-0.06

# 0-lepton (7-10 jets) – SR counts

Signal region	8j50	
$M_J^\Sigma$ [GeV]	340	420
Observed events	69	37
Total events after fit	$75 \pm 19$	$45 \pm 14$
Fitted $t\bar{t}$	$17 \pm 11$	$16 \pm 13$
Fitted W+jets	$0.8^{+1.3}_{-0.8}$	$0.4^{+0.7}_{-0.4}$
Fitted others	$5.2^{+4.0}_{-2.5}$	$2.8^{+2.9}_{-1.6}$
Total events before fit	85	44
$t\bar{t}$ before fit	27	14
W+jets before fit	0.8	0.4
Others before fit	5	2.8
Multi-jets	$52 \pm 15$	$27 \pm 7$
$N_{\text{BSM}}^{95\%}$ (exp)	40	23
$N_{\text{BSM}}^{95\%}$ (obs)	35	20
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon$ (exp) [fb]	1.9	1.1
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon$ (obs) [fb]	1.7	1.0
$p_0$	0.60	0.7
Significance ( $\sigma$ )	-0.27	-0.6

Signal region	9j50		10j50	
$M_J^\Sigma$ [GeV]	340	420	340	420
Observed events	13	9	1	1
Total events	$17 \pm 7$	$11 \pm 5$	$3.2^{+3.7}_{-3.2}$	$2.2 \pm 2.0$
$t\bar{t}$	$5 \pm 4$	$3.4^{+3.6}_{-3.4}$	$0.8^{+0.8}_{-0.8}$	$0.6^{+0.9}_{-0.6}$
W+jets	-	-	-	-
Others	$0.58^{+0.54}_{-0.33}$	$0.39^{+0.32}_{-0.30}$	$0.12 \pm 0.12$	$0.06 \pm 0.06$
Multi-jets	$12 \pm 4$	$7.0 \pm 2.3$	$2.3^{+3.6}_{-2.3}$	$1.6^{+1.8}_{-1.6}$
$N_{\text{BSM}}^{95\%}$ (exp)	13	11	5	5
$N_{\text{BSM}}^{95\%}$ (obs)	11	10	4	4
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon$ (exp) [fb]	0.7	0.5	0.23	0.23
$\sigma_{\text{BSM,max}}^{95\%} \cdot A \cdot \epsilon$ (obs) [fb]	0.5	0.5	0.2	0.2
$p_0$	0.7	0.6	0.8	0.7
Significance ( $\sigma$ )	-0.6	-0.34	-0.8	-0.6